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## Notes on the Habits of Some Argentine and Peruvian Woodpeckers (Aves, Picidae)

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### INTRODUCTION

I conducted studies of woodpeckers in Argentina during September to December, 1967, and during September and October, 1968, and in Peru during July to September, 1968. The primary objective was to analyze hybridization among closely related forms of woodpeckers. A secondary objective was to obtain as much information as possible about the habits of woodpeckers that were encountered. Information on the habits of seven species that were studied intensively is reported elsewhere (Short, In press a,b,c; Short, MS.). These species, *Campephilus magellanicus*, *Colaptes atricollis*, *C. punctigula*, *C. melanochloros*, *C. campestris*, *C. pitius*, and *C. rupicola*, are listed here for the sake of completeness, and their distribution is indicated with respect to the localities that I visited. The present paper discusses the habits of 18 other woodpeckers.

In Argentina concentration was in the chaco woodland of Santa Fe and Formosa, the pampas and riverine woodlands of Corrientes, the subtropical forests of Misiones, and the false beech (*Nothofagus*) forests and their edges in Neuquen and Rio Negro. The studies I made in Peru reported below took place in moist subtropical forest near Tingo Maria, and in moist montane forest (lower limit of "cloud" forest) of the Car-

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pish Mountains, both in the Department of Huanuco. Figures 1 and 2 depict two areas in which the studies were conducted (see below).

The taxonomic treatment and arrangement of species followed in the present paper is that proposed by Bock and Short (MS.) in their revision of the Picidae.

The terminology employed for modes of foraging is generally self-explanatory. I distinguish "pecking" from "tapping" and from "excavating" as follows: Pecking is the hitting of a surface once or twice with the bill, usually not repeated. Tapping is the hitting of the surface in a series of about three to five blows, usually not repeated. Both pecking and tapping barely penetrate the surface of the bark, and they are in many cases used to break off a hanging piece of bark or to enlarge a crevice (either a natural crevice or one forced by the probing of the bill). Excavating is a series of hard blows with the bill, often repeated, and usually employed in digging into the subsurface (it is the same technique as that used in making a nesting or roosting cavity). Most bird watchers are acquainted with these distinctions, because the loudness and repetitiveness of the excavating noise enables the observer to follow it to its source. In contrast, the pecking and tapping of a wood-pecker are neither loud nor repeated and are therefore of little use in locating the bird unless the observer happens to be very close to it.

Some of the localities mentioned below (in Corrientes) are described or mapped elsewhere (Short, In press b, fig. 1). A full listing follows; the number preceding each locality is that used in table 1.

#### MISIONES, ARGENTINA

1. 14-19 kilometers from Tobuna, about 700 meters. October 5, 1967. Upland subtropical moist forest, scattered Brazilian pines (*Araucaria brasiliiana*).

2. 8 kilometers southwest of San Pedro, 400 meters. October 6-9, 1967. Upland subtropical moist forest, second growth, cut-over land, cultivated land. Brazilian pines common.

#### CORRIENTES, ARGENTINA

3. 8 kilometers northeast of Alvear, 70 meters. Estancia Santa Ana, Uruguay River. September 23-25, 1967. Riparian woodland, mainly second growth, extension from Misiones of subtropical forest. Narrowly confined to the edge of the river, and surrounded by pampas grassland.

4. 6 kilometers southwest to 25 kilometers east-southeast of Colonia Garabí, all on Estancia Rincón de las Mercedes, 150 meters. September

26–October 1, 1967. Extensive riparian forest (extension of subtropical moist forest from Misiones) along Uruguay River, and upland pampas grassland with scattered isolated patches of “monte” (woodland).

5. 25 kilometers east of Ituzaingó, 75 meters, Parana River, Estancia Puerto Valle. October 11–15, 1967. Pampas grassland and cultivated edges (orchards, fields) abutting on riparian forest (larger trees are constantly being cut down), an extension of subtropical moist forest from nearby Misiones (Short, In press b, fig. 5).

6. 14 kilometers north of Ituzaingó, 70 meters, Parana River, Salto Apipe. October 21–27, 1967. Riparian forest, ecotonal between chaco woodland and (riparian) subtropical moist forest, surrounded by lush pampas grassland. Dense forest (bamboo) on islands in the river (Short, In press b, fig. 4).

7. 30 kilometers west-northwest of Ituzaingó, Parana River, 65 meters, Estancia Santa Ana Nu. October 16–19, 1967. Extensively cut-over ecotonal riparian woodland (see 6 above), narrowly restricted to the river edge and in scattered patches away from the river, but well developed on islands in the river. Orchards, pasture, fields, marshes and pampas grassland border the riparian woodland.

8. 3–21 kilometers east-southeast of Itá-Ibaté, 60 meters, Parana River. October 28–November 6, 1967. Extensive ecotonal (see 6 above) riparian woodland near river (although not cut-over, larger trees are selectively cut down and removed), and along an escarpment (old bank) back from the river. Marshes and pampas grassland, with pastures and cultivated fields border the river woodlands, and dense woods cloak some of the islands in the river (Short, In press b, fig. 3).

#### FORMOSA, ARGENTINA

9. Banco Payagua, 60 kilometers south-southwest of Formosa (city), 70 meters, Paraguay River. September 23–29, 1968. A variety of habitats—interspersed chaco woodland, palm savanna (“pantanál”), and pampas grassland inland from the river, with riparian forest, including bamboo forest near the river.

10. 14 kilometers northwest of Espinillo, 150 meters, 8 kilometers south of South Branch of Pilcomayo River, Estancia San Blas. September 17–22, 1968. Cut-over and pastured chaco woodland, intermixed with palm groves and some open pastures and cultivated fields (fig. 1).

#### SANTA FE, ARGENTINA

11. Vicinity of Mocoví and Villa Ana, west of Villa Ocampo, 35

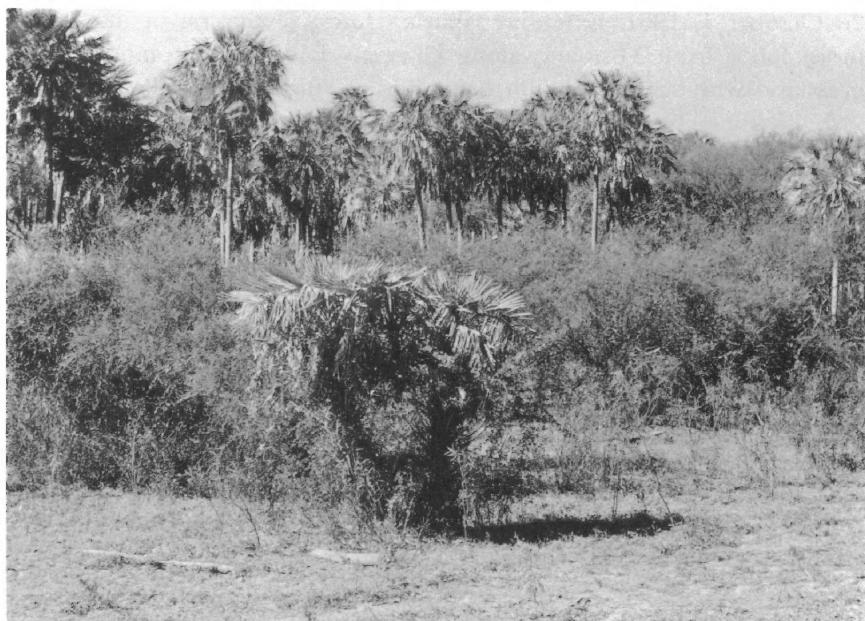


FIG. 1. Edge of pastured chaco woodland northwest of Espinillo, Formosa, Argentina (locality 10, see text). Habitat of: *Picumnus cirratus*, *Picoides mixtus*, *Melanerpes cactorum*, *Piculus chrysochloros*, *Colaptes melanochloros*, *Colaptes campestris* (open pasture only), *Celeus flavescens*, and *Campetherus leucopogon*.

meters, northern Santa Fe. October 1-3, 1968. Open esteros (marshes) interspersed with low (6-8 meters tall trees) to moderate (15 meters tall trees) chaco woodland, and some pampas grassland with cultivated fields.

12. 5 kilometers northeast of Santa Fé (city), near Paraná River, 25 meters. Cultivated fields, houses, pampas with scattered groves of small trees.

#### BUENOS AIRES, ARGENTINA

13. 21 kilometers west of Medanos, 2 kilometers northwest of Lavalle (west of Bahía Blanca), 50 meters. December 2-3, 1967. Open pampas grassland with extensive areas of low chaco woodland (trees to 5 meters in height). (See photographs, Short, 1968.)

#### NEUQUEN, ARGENTINA

14. 18 kilometers north of San Martín de los Andes, 1000 meters, 3

kilometers north of Lake Lolog. November 19-23, 1967. Primary Fuegian (*Nothofagus*) forest, forest edge, second growth forest and some pastures. (See photographs, Short, In press a.)

#### RIO NEGRO, ARGENTINA

15. 16-26 kilometers east-northeast of San Carlos de Bariloche, 1000 meters. November 26-27, 1967. Lower Andean grassland, stream with riparian scrub woodland and edge. (See photographs, Short, In press a.)

16. 2 kilometers west of Río Villegas, 700 meters, Villegas River, 54 kilometers south-southwest of San Carlos de Bariloche. November 28-29, 1967. Tall but cut-over Fuegian (*Nothofagus*) forest.

#### HUANUCO, PERU

17. 7 road kilometers northwest of Carpish Pass, 2450 meters, Carpish Mountains, Hacienda Paty. July 31-August 4, 1968. Steep mountain slopes, almost uncut ceja (cloud) forest about at the upper boundary of lower montane moist forest.

18. 15 kilometers north-northeast of Tingo María, 650 meters, 4 kilometers north of Tulumayo River. August 15-17, 1968. Hilly, second growth subtropical moist forest, with a small marsh and some edge. Limited cultivation (fig. 2).

#### SPECIES ACCOUNTS

##### *Picumnus cirratus*

##### WHITE-BARRED PICULET

This little piculet is rather common in chaco woodland and extends eastward in Argentina across northern Corrientes along the Paraná River. Nesting is apparently late, for no nests were found, breeding behavior was not observed, and the gonads of birds collected were only beginning to enlarge in late October. This piculet forages in a woodpecker-like manner over small branchlets and vines at all heights, but more commonly at lower heights in the undergrowth. It is active, moves and works diligently, and pays no attention to the human observer. Its foraging consists of probing, gleaning, and frequent tapping. As a result of the latter one can readily locate this piculet by the sound of its activities. As noted by Wetmore (1926), the tapping is apparently delivered with little or (probably) no use of the non-stiffened tail as a prop. These piculets also can progress downward on a vertical branch or vine in the manner of nuthatches (*Sitta*), although they do not often do so. Their food consists of small insects obtained on the bark of a tree and just



FIG. 2. Small marsh at edge of second-growth subtropical moist forest north-east of Tingo María, Department of Huanuco, Peru (locality 18, see text). Trees in marsh were visited by: *Melanerpes cruentatus* (nesting in marsh), *Colaptes punctigula* (nesting in marsh), *Dryocopus lineatus*, and *Campephilus melanoleucus*. This marsh is type locality of newly described blackbird *Agelaius xanthophthalmus* (Short, 1969).

below its surface.

Although no reproductive behavior was observed, I heard and watched piculets drum several times. Their drumming is staccato-like, and very loud for their small size. The tail of the piculet is not closely appressed to the surface of the tree when it drums, but its posture is otherwise that of any drumming woodpecker. Its nesting and roosting cavities were observed frequently, the neat little holes marking these cavities being far smaller than those of any other woodpecker. Apparently, the White-barred Piculet utilizes dead stubs at all heights in the trees for excavating such cavities, but in most cases we encountered the cavities in low, small dead stubs. As this piculet appears able to take advantage of stubs smaller in diameter than those required by other woodpeckers, the occurrence of many low stubs often leads them to nest lower than do other woodpeckers.

Their legs are gray-black, the eye color is brown to chestnut, and the

bill is black with a white base below. Males, all with testes of 4 by 3 mm. or less, weighed 10.1 to 11.8 grams, and one female weighed 8.7 grams.

*Picoides (Dendrocopos) mixtus*

CHECKERED WOODPECKER

This species is essentially a bird of scrub or dry woodland, including the Chaco. It was frequently observed only in the vicinity of Espinillo, Formosa, but was seen also in southeastern Formosa and in Santa Fe. Although we observed it casually, some foraging and breeding behavior was noted.

Checkered Woodpeckers drum more loudly than does *Veniliornis passerinus* or *Melanerpes cactorum*. Vocalizations heard were the "peek" call note, and the rattle call "ti-ti-ti-ti-ti-ti-ti-ti-ti." The drumming and calls are like those of other species of *Picoides* (*P. scalaris*, *P. pubescens*) and unlike those of species of *Veniliornis* that we have noted. One rattle call was given by a lone male, which was feeding in an isolated group of two small trees beside a house in open pampas grassland, near the city of Santa Fe. The foraging male ceased feeding on my approach, gave the rattle call, and then flew off in the direction of other trees 200 meters away. The call was rendered as it perched crosswise on a branch, and its wings were slightly raised as it called. Other individuals interrupted by my approach usually ceased foraging and commenced calling ("peek").

No aggressive encounters were observed. The species occurred singly or in pairs. One pair apparently was constructing a nest on September 18, as first the female and then the male (female perched nearby), entered the hole 3 meters up in a dead palm tree and excavated. The female was excavating for 10 minutes before the male arrived, and he was still working, frequently appearing at the entrance to drop wood chips, when I left. Another male was seen entering a cavity 6 meters up in a solitary palm tree in a pasture, so the species is not absolutely restricted to woodland. Foraging was rarely done by prolonged tapping into the subsurface of a tree and we never encountered this species foraging by excavating in trees. Indeed, such tapping as I heard was barely audible, and then probably because I was sufficiently close and attentive to hear it. Although their drumming often indicated their presence, I never heard tapping by this species as I wandered through the woods. Rather, their foraging consisted of surface-gleaning and probing into crevices, with an occasional peck or two. A sustained tapping was rarely employed to secure food.

Two females weighed 26.3 and 27.1 grams and a single male weighed

27.5 grams. The latter, which was drumming sporadically and calling "peek" before it was collected, had testes measuring 4 by 3 mm. The gonads of the females (specimens prepared in alcohol) were not examined. Eye color in this species is red-brown, and the feet are gray.

*Picoides (Dendrocopos) lignarius*

STRIPED WOODPECKER

This little woodpecker barely differs from the closely related Checkered Woodpecker which it replaces in the Andean and Patagonian *Nothofagus* forests. We found it to be quite scarce in mature and second-growth forest and forest edges in Neuquen and Rio Negro during November, 1967. In this region it shares the forests with the large Magellanic Woodpecker (*Campephilus magellanicus*; see Short, In press a), which is much more common than the Striped Woodpecker. The only other woodpecker in the region is the Chilean Flicker (*Colaptes pitius*), which, however, is a terrestrial forager. The latter species extends eastward out of the Andes in the scrub-woodland that borders streams (or used to border them; in some cases, as along the upper Limay River, most of this woodland has been cut down and replaced by pastures and stands of eucalyptus trees). If the Striped Woodpecker did the same, its range would extend in a direction facilitating a contact with the Checkered Woodpecker inhabiting streamside scrub-woodland in the lowlands to the east. It does not, and there is at present a hiatus between the ranges of these two woodpeckers. The distribution of the Striped Woodpecker thus coincides with that of *Nothofagus* forest in this region.

No more than a half-dozen Striped Woodpeckers were seen, all but one within the forest. A single male was noted foraging in low (up to 4 meters) bushy second-growth (*Nothofagus*) on land which I surmised had once been cleared for pasturing cattle. This bird was about 400 meters from primary woodland which was in direct contact with the second-growth woods. Foraging took place in the smaller branches and branchlets in all cases (although birds that I flushed sometimes flew to the trunks of large trees, there to peck and forage industriously but in an abnormally hasty manner; I consider this an example of "displacement foraging," which I have seen in other woodpeckers). The manner of their foraging is like that described for *P. mixtus*, except that there is somewhat more tapping. My field notes state that foraging in one of the Striped Woodpeckers was "like that of *P. nuttallii*," namely with probing, surface-gleaning, occasional prying with the bill, and bouts of tapping.

Two types of calls were heard: a "peek" call note, and a long rattle.

Both were heard in circumstances similar to those in which they were given by *P. mixtus*. These vocalizations are like those of *P. mixtus* and *P. scalaris*, but are lower and less harsh.

Three specimens were obtained at 18 kilometers north of San Martín de los Andes, near Lake Lolog (elevation 1000 meters), Neuquén. Two females weighed 36.2 and 35.4 grams, and a male weighed 38.0 grams. All had moderately enlarged gonads (females: 6 by 5 mm., small oviduct and ova; and 6 by 6 mm., ova to 1.5 mm., oviduct small; male with testes of 4 by 2.5 mm. and 3 by 1.5 mm.), and partially or fully formed brood patches. The specimens were obtained on November 20 and 23. Eye color varies from brown to chestnut and the legs of this species are gray. The bill is black above with a pale base, and pale below with a dusky tip.

*Melanerpes (Leuconerpes) candidus*

WHITE WOODPECKER

A few White Woodpeckers were observed along the Paraná River in northern Corrientes, and in Misiones, Argentina, in October and November, 1967. The first bird encountered was alone in a dead tree situated in an open field in hilly, cut-over subtropical forest (largely cleared for cultivation, except for ravines) about 50 kilometers north of Dos de Mayo, Misiones. A number of dead trees were scattered about. The White Woodpecker called "kreer" several times, and emitted one longer call which I rendered "cree-cree-cree-creek." The latter sounds like calls of other species of *Melanerpes*, including *M. cruentatus*. Mitchell (1957, p. 123) considered its call "very like the 'churring' note of the Red-headed Woodpecker (*Melanerpes erythrocephalus*), only harsher and a little louder." I observed another bird near the Paraná River at 30 kilometers west of Ituzaingó, Corrientes. The woodpecker flew over me from the direction of an *estancia* (ranch) one kilometer to the south. It perched momentarily at the top of a small tree in a large field, then continued its flight, flying high, in the direction of an island in the Paraná River, about 2 kilometers to the north. Workers at the *estancia* knew the bird well, complaining that groups of the *carpinteros blancos* visited the orchards to gorge on ripening oranges. At 13 kilometers east of Itá-Ibaté, Corrientes, on November 1, I encountered three White Woodpeckers in trees around the orchard of a small farm. The birds flew into a clump of bamboo and called "kweee" at me for a couple of minutes. I secured one of them, a male with greatly enlarged testes (right, 12 by 8 mm.; left, 14 by 9 mm.) and a brood patch, and weighing 129 grams. Soft part colors of this specimen were: bill black with a whitish base ven-

trally; legs and feet greenish gray; iris white; and bare skin around the eyes bright golden-yellow. Its stomach contents were well-ground plant material. Kerr (1892, p. 135) reported "only honey" in the stomachs of two birds that he collected near the Pilcomayo River.

The flight of this species is somewhat peculiar, with more flapping than is normal for a woodpecker, reminding me of the flight of the Lewis' Woodpecker (*M. lewisi*). Wetmore (1926, p. 218) has commented on its flight, gregariousness, and habits. Its vocalizations are melanerpine, and its habits so far as they are known indicate that the White Woodpecker is not generically separable from *Melanerpes* (see Goodwin, 1968, p. 16, and also Wetmore, *loc. cit.*).

*Melanerpes cruentatus*

RED-FRONTED WOODPECKER

Brief observations of a communal group of at least 11 Red-fronted Woodpeckers were made from August 15 to 17 at 15 kilometers northeast of Tingo María, Huánuco, Peru. These birds, all apparently adult, were engaged in nesting activities at two holes about a half meter apart near the top of a 15-meter tall dead stub, and one near the top of a dead (palm) stub about 75 meters away. Other species utilizing crevices in nearby dead trees scattered about a small marsh in cut-over subtropical forest were: *Colaptes punctigula*, *Pteroglossus castanotis*, and probably *Campetherus melanoleucus* and *Campylorhynchus turdinus* (Short and Morony, 1969). Below the trees in the marsh were various birds including especially *Donacobius atricapillus* and the newly described (Short, 1969) *Agelaius xanthophthalmus*.

The Red-fronted Woodpeckers appeared to be nesting communally, that is, various individuals moved from nest tree to nest tree, and from nest cavity to nest cavity. At least two, and probably all three, cavities contained young birds, ascertained by noting adults tossing fecal material from the nest entrances. At least one female entered all three nesting cavities, one after the other, in the course of three minutes. This female did not pause between visits, but moved directly from nest to nest. Whether it fed young in all three nests is unknown. Three other adults entered one cavity, then a second cavity immediately afterward.

Usually only one, but occasionally two adults occupied the topmost point of each nesting tree at one time. When there was but a lone bird, it was always a male. Several times, however, I noted a male fly from this perch at one tree to the top of the other nesting tree. Otherwise, individuals and groups of up to four woodpeckers frequently flew from one nest tree to the other, and occasionally back again. Thus, there is

every indication that these adults comprised a communal nesting colony, with all individuals mutually involved in the affairs occurring at each of the three nest sites. Such communal nesting is otherwise known only in the related Acorn Woodpecker (*Melanerpes formicivorus*; Skutch, 1943; Short and Crossin, 1967). I suggest that it may occur as well, although probably to a lesser extent, in *Melanerpes flavifrons*, *M. chrysauchen* (see Skutch, 1948), *M. pucherani*, and possibly other species of *Melanerpes* (*candidus*?, *portoricensis*?).

Adults flying to the nest sites appeared to have material in their bills. I noted that after entering a cavity the birds remained briefly. In many cases they left the nest less than a minute after entering, and no bird remained inside a nest longer than two minutes. One female came to a cavity entrance three times in succession, put its bill out of the entrance, and shook its head, dropping loose, fecal material (I documented this with movies). In many instances an adult flew to the nest entrance while another bird was still inside. In all but one instance the bird in the nesting cavity immediately departed; in that instance a male looked outside, then drew its head back. The newcomer remained nearby for another half-minute, and when the occupant left, it immediately entered the cavity. Unfortunately, I did not secure data regarding stomach contents of the few birds that we collected.

Several displays were observed and recorded on film. A Wing Spreading Display is the most conspicuous that I noticed. This is rendered: 1) by an incoming bird just after it alights close to another woodpecker; 2) by a bird approaching another on foot, especially when one bird suddenly appears from the other side of a tree and thus approaches (perhaps startles) another bird; 3) occasionally by a bird which is perched when a newcomer alights nearby and spreads its wings in display; and 4) by a bird alighting at the entrance to a nesting cavity, particularly if the cavity is occupied by another adult. Special vocalizations were rendered during this display that differed from those in situations 1 to 3, and situation 4 above (see discussion of vocalizations below). Wing Spreading involves the extension of the wings over the bird's back to a nearly vertical position. The wings may be held extended for a few seconds before they are returned to the normal position. Wing Spreading was noted in the Red-headed Woodpecker (*M. erythrocephalus*) by Kilham (1958).

Analysis of moving pictures disclosed that a complex of postures and movements is interwoven into a series of subtle displays. These are illustrated in figure 3. One of them is Bill Directing-Head Turning, a common agonistic display in woodpeckers and other birds (Short, pers.

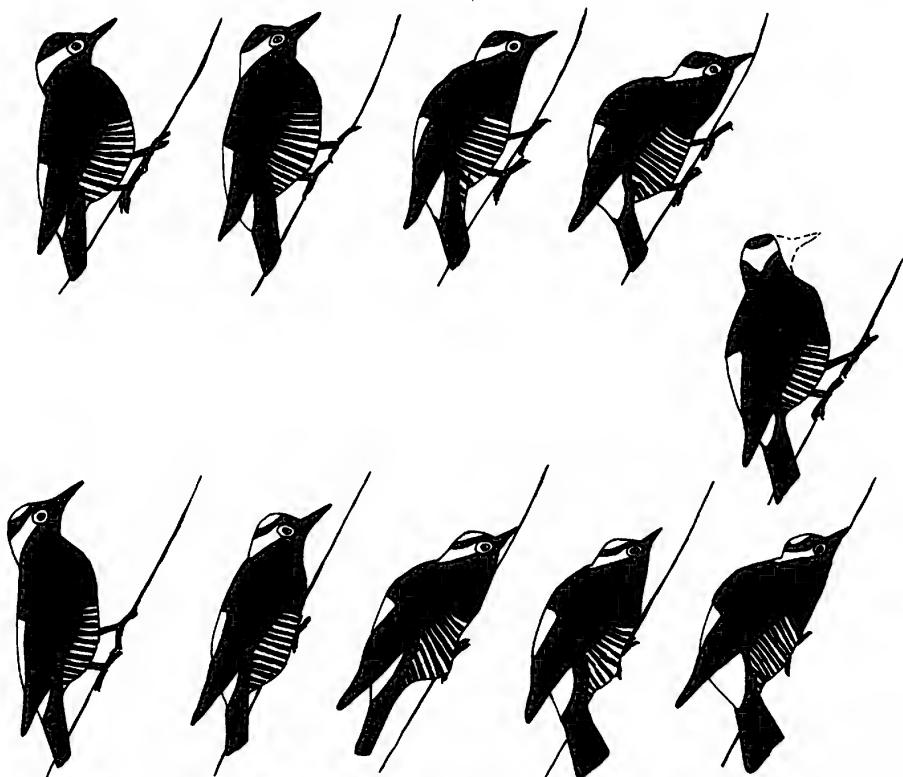


FIG. 3. *Melanerpes cruentatus* displays. Top four figures depict Bowing Display of a female. Action from left to right shows female Bowing toward an antagonist above; recovery to a normal position is reverse of this sequence. Single figure at right shows a female Head Turning (from dashed lines to solid lines, then back again) at another female around trunk and slightly above. Bottom sequence shows a male in a combined Bowing and Swinging display; action proceeds from left to right. Note tail movement in latter display. These displays also incorporate as elements Bill Directing Display (third figure from left at top, second figure from left at bottom) and Hunched Posture (top right, bottom right). Figures were traced from 16 mm. movie frames.

observ.; see Moynihan, 1955, for discussion of agonistic displays). This involves the thrusting of the bill toward an opponent, emphasizing its threat aspect, or the upward, and especially sideward, turning of the head which directs the bill away from an antagonist, thus emphasizing the fear aspect of the display. Head Turning exhibits to an antagonist the white eyestripe and golden nape patch, which thus may be involved in this display. I noted five instances of a bird, perched within 30 to 50 cm. of another, leaning forward, thrusting its bill toward the other

bird, and then returning to a normal posture. In three of these cases the other bird turned its body, facing away from the displaying bird. This display is very rapid, occurring in one-half second or less.

A Hunched Posture (fig. 3) is incorporated into the Bowing Display, and it also appears to reflect a conflict between tendencies to attack or threaten (head and bill forward), and to flee (the act of hunching withdraws the body somewhat from an opponent, although the bill is pointing at it). Six instances were noted, in two of which the Hunched Posture was momentarily held. Usually the displaying bird continued its Bowing Display. The latter, observed 10 times, was seen more frequently than any display other than Wing Spreading. Bowing involves the forward-thrust bill of the Bill Directing Display; indeed, it may be considered a more ritualized form of that display. It also emphasizes the upward withdrawal of the bill and head, probably indicating a tendency to flee. Thus, this display seems to show the ambivalence (threat tendency versus flee tendency) typical of agonistic displays. A bird rendering this display rapidly lowers its head and body from a normal position, facing an antagonist, then lifts its head immediately. Variations include: 1) the addition of the Hunched Posture within the display sequence; 2) the addition of the Swinging Display; and 3) one instance of a pause in the forward position, followed by three, rapidly repeated, even deeper (bill lowered farther) bows. The Bowing Display usually was directed toward an antagonist, but in one case the displaying bird faced to the side, away from the antagonist. In this case the display commenced after a Head Turning Display.

The Bowing displays that were observed varied in the depth of the bow, which displays or postures were incorporated, and the initiating and recovery posture (head turned, or not). As in the case of the Bobbing and Swinging displays of the flicker (*Colaptes auratus*; Short, pers. observ.), these nuances enable the displaying bird to indicate precisely to its opponent the intensity of its motivation and the relative strength of attack and flee tendencies. Unfortunately, I was not able to establish whether vocalizations accompanied these displays, because of their brevity and my preoccupation with obtaining movies. Detailed studies of this and other displays of the Red-fronted Woodpecker are required to fully establish its display repertoire and the function of each display. Responses to the Bowing displays were not adequately determined. One woodpecker responded to such a display with an abbreviated Bow (not very deep) directed at its displaying antagonist. Certainly no individual was driven off to the extent of flying away. Elaborate but rapid displays such as Bowing and its associated postures and displays may be essential

in maintaining individual distance among such social birds, as five, six, or even more woodpeckers may be concentrated in a small area on a stub at one time. Bowing has been noted in *Melanerpes erythrocephalus* by Kilham (1958).

The single Swinging Display that I observed was incorporated into a lengthy (one second) Bowing Display (fig. 3). The body of the displaying bird was turned slightly, with the tail particularly swung to one side. Such Swinging displays, repeated and much more elaborate (tail spread, which it was not in *M. cruentatus*), comprise a conspicuous and significant portion of the displays of certain other woodpeckers (genera *Colaptes*, *Picoides*). Indeed, at greater intensity the Swinging Display may be more elaborate in the Red-fronted Woodpecker. Swinging may show portions of the tail and sides of the body not exhibited to an antagonist during other displays. To the extent that the head, too, swings with the body, the bill is changed in position during the swing from forward (a threat posture) to the side (flee or escape tendency shown).

The vocalizations of *M. cruentatus* are variable, and they sound like those of *M. formicivorus* (pers. observ.; see also Skutch, 1948, p. 256) and *M. erythrocephalus* (pers. observ.) as well as those of the very closely related *M. chrysauchen* and probably *M. pucherani* (Skutch, 1948). I have categorized these vocalizations in two types, those given by lone individuals, and those given by two or more interacting birds. The individually rendered calls were noted as follows: a) "chowp" call b) "churrr-dowp" call (often repeated).

These calls were occasionally uttered when a lone bird flew into a treetop in the woods, but more often, they were given when an individual landed at the top of a nest tree if no other Red-fronted Woodpecker was present. For such a highly social species it would be futile to discuss the function of these calls without more detailed field studies. Some possibilities are: localization notes, alert or alarm calls (the result of my presence?), and territorial calls.

The social calls that I noted were: (a) a very rapid "kwi-wi-wi-wi-wi-wi-wi-wi-wi-wi-wi"; (b) "chew-chew-chew-chew-chew-up" resembling food begging calls of baby birds; (c) "kwi-kwi-kwi-kwi-kwi," slower than (a), raspy, and with something of the quality of a "chwi" in it; (d) "kew-kew-kew-kew-kew"; (e) a mixture of these notes: "kwi-dip, kwi-dip," "chow-chow-chup," "kwi-dip, che-che-che, churr-churr," and "churr-churr"; and (f) "cat-sup, cat-sup, cat-sup, cat-sup" with a nasal quality. Two males and a female together, the males Wing Spreading, rendered nearly simultaneous calls of type (a). Notes (b) and (c) were emitted principally during interactions between two individuals, with

the sexes either alike or different. Note (d) was the prevalent call when a bird flew directly to a nest cavity; a bird inside usually responded by exiting from the nest. The assemblage of notes in (e) resulted from an incoming male at one of the nest trees; another male and a female were perched near the top of the tree, and at least two birds were on the trunk somewhat below (there may also have been a bird in the nest cavity). I could not be certain which bird rendered which notes, but the vocalizations were accompanied by Wing Spreading by at least the three birds in the topmost part of the tree. The prevalent call uttered when two birds met was note (f). All of the calls in both categories were tape-recorded except (d) and (f). Presumably these calls have somewhat different functions. All are probably agonistic vocalizations, perhaps reflecting differing intensities of threat and escape tendencies (Moynihan, 1955). At least (d) may have been ritualized further to act as a signal allowing rapid replacement of adults bearing food at the nest site. This would appear to be particularly important if many, not necessarily mated, adults are feeding young at several different nests. Further studies are needed to precisely elucidate the functions of these (and probably other yet undescribed) vocalizations.

Four adults taken from the colony weighed from 61.1 to 64.0 grams; the sole female among them weighed the least. The males had enlarged testes (over 8 by 6 mm.), whereas the ovary of the female measured 7 mm. across, with ova up to 3 mm. in diameter. The latter bird appeared to have laid eggs as its oviduct was enlarged. All four birds had fully developed brood patches. This species has a black bill, gray legs, eye color varying from lemon yellow to gold, and the bare skin around the eyes is yellow.

*Melanerpes flavifrons*

YELLOW-FRONTED WOODPECKER

Three individuals of this species were observed together briefly on October 8, 1967, 6 kilometers west of San Pedro, Misiones. The woodpeckers seemed to be engaged in a display in the top of a tree that was taller than the others in the area of cut-over subtropical moist forest. The distance was too great, however, to afford an opportunity to describe the displays before the birds flew off.

*Melanerpes (Trichopicus) cactorum*

WHITE-FRONTED WOODPECKER

Although widespread in areas of the Chaco in which there are many

cacti, White-fronted Woodpeckers are also common in areas with less cacti, particularly those in which palm trees grow. The birds were common near Espinillo in northern Formosa, and farther west in that province, rare in eastern Formosa near the Paraguay River, and we saw none in Corrientes and Misiones. This woodpecker forages quietly, often picking food (ants?) from tree trunks, mainly in the higher portions of trees. It occurred in groups of three to five birds, and less frequently in pairs. The breeding season apparently commences in September, and several presumed nesting sites (all in palm trees) were occupied at that time.

Vocalizations of the White-fronted Woodpecker include a "weep" or "weep-weep" call, reminiscent of sapsucker calls (*Sphyrapicus varius*), and a faster "wee-beep" rendered by three birds flying off together from a palm in which they had been displaying. Four birds (two birds of each sex) perched as if they were in pairs, and I noted a series of "weep" calls punctuated by a vague bobbing of the head of one male. Wetmore (1926, p. 217) mentioned one or two other calls of this species. Drumming was frequent but not sustained, and seemed relatively subdued in comparison with that of *Picoides mixtus*. Most drumming episodes involved a lone bird drumming beside a nesting cavity. The flight of this species is of a peculiar, darting nature which struck me as quite unwoodpecker-like. Flying birds disappeared rapidly from view, and were relatively inconspicuous in their movement through the air.

A male that was collected at a hole in a palm tree weighed 33.3 grams. Another male, observed with a female (not collected) at a similar cavity, weighed 39.0 grams and had ants in its stomach. The testes of this male were slightly enlarged (4 by 3 mm.). The eye color is brown to reddish brown, the bill is black, and the legs and feet are gray.

The sociality, vocalizations, and morphology of this woodpecker are melanerpine, and it does not differ sufficiently from other species of *Melanerpes* to warrant recognition as a monotypic genus.

*Veniliornis passerinus*

LITTLE WOODPECKER

This chaco species replaces the more eastern *V. spilogaster* (possibly closely related to *passerinus*) in northern Corrientes, and it occurs westward into the Chaco of the provinces of Formosa, Chaco, and Santa Fe. Interaction with the Checkered Woodpecker (*Picoides mixtus*) is suggested by the abundance of the Little Woodpecker in northern Corrientes from which the Checkered Woodpecker is absent, and its scarcity farther westward in the Chaco, in which Checkered Woodpeckers are

common. In Corrientes I noted no particular habitat preference of *V. passerinus*—it occurred wherever woodlands were present, even in woodland patches of no more than two acres, scattered about the pampas grassland. In the presence of Checkered Woodpeckers in Formosa, Little Woodpeckers were observed only in bamboo groves along major streams; indeed we did not see them elsewhere, although they may occur sparsely in chaco woodlands. This species forages much as do species of *Picoides*, by probing, excavating, and gleaning at all heights on tree trunks, branches and branchlets, and especially on bamboo shoots. They seem to prefer the latter for feeding, and often drilled around the nodes of the shoots.

Breeding was under way in October in Corrientes, although not all adults were breeding as yet. A male was excavating a hole 13 meters up in a dead stub on October 13. Richard S. Crossin and I encountered an adult male feeding two half-grown juvenal males in a nest cavity in the limb of a tree 5 meters up from the ground on an island in the Parana River on October 27. Other cavities, probably used by this species, were frequently seen high in bamboo stalks (the bamboo is *Guadua trinii*, called *tacuara brava* by Argentines, and it attains a height of more than 30 meters). Larger bamboo shoots seem ideal for the nesting of this woodpecker, as a single section (internode) of a 10 to 12 cm. thick shoot measures 25 to 30 cm. between nodes. The October male had a brood patch and enlarged testes (the slightly curved left one measured 8 by 4 mm., and the normally shaped right one, 5 by 4 mm.). The testes of a foraging male collected on October 12 were 4 by 3 mm. A single female with its ovary undamaged had an ovary measuring 8 by 5 mm., no large ova, and no brood patch.

Two types of vocalizations were heard from these woodpeckers. The first, a territorial call (the equivalent of the "wick-wick" long call of *Colaptes auratus* and the "whinny" of *Picoides pubescens*), was rendered "wi-wi-wi-wi-wi-wi" in my notes. This call is slower than the similar calls of species of *Picoides*, and sounds more colaptine. It was uttered by a lone male at the cavity it had been excavating as I approached it. Another male called in this manner after it gave a short burst of drumming on the branch of a small tree. The other vocalization heard was the "wick-a" agonistic call, similar to that of the flicker *Colaptes auratus*. This call marked an encounter between two males on October 27. The birds had been feeding in bamboo shoots. One male flew to a position 10 cm. below the other. As it moved upward, it swung its head slightly from side to side and both birds called a low "wik-wik-wik-wik-wick" call. The upper bird faced half downward, then both birds spread their

wings over their heads, moving toward each other (the upper one sidling and swinging its head) and calling the same "wik-wick" call. They flew off in pursuit of each other, leaving me behind (I was unable to follow them, as movement about the base of a bamboo clump is restricted by its dense and spiny runners). Another brief encounter was noted in a bamboo thicket on November 2. A male and female had been feeding near each other when a second male appeared. The first male flew to a perch beside the second male, swung its head momentarily as it called "wick-a, wick-a" with its tail half spread, and then lunged at the other male, which fled. The second male had also swung its head somewhat and it too probably called.

The males that we collected weighed 34.3 and 31.5 grams, and the females weighed 30.0, 36.3, and 35.5 grams. Two juvenal males which were being fed at a nest entrance weighed 35.1 and 34.6 grams. The eyes of adults are dark brown, but the juvenal males had milky blue irides. In the race (*olivinus*) occurring in Argentina the red crown of the adult male is restricted to a broad nuchal patch. The juvenal males have an all red crown, but no red is present in the nuchal area.

*Veniliornis spilogaster*

WHITE-SPOTTED WOODPECKER

A few White-spotted Woodpeckers were found in Misiones and Corrientes, Argentina. No other species of this genus was sympatric with it, for in Corrientes this species occupies the eastern region drained by the Uruguay River, whereas the Chaco-inhabiting *V. passerinus* replaces it in northern and western Corrientes. The White-spotted Woodpeckers that we observed were seen low in small trees in an overgrown field. Three specimens that we collected in late September and early October weighed from 36.0 grams to 40.0 grams. Their gonads were enlarged, but egg-laying had not yet commenced (two birds had a beginning brood patch, but the other did not, and both females still had tiny ova and a small oviduct). These woodpeckers tap lightly, occasionally excavating, and working their way over the bark in the manner of species of *Picoides*. The stomach of one bird contained small grubs and coleopterous larvae. The only vocalization that we heard was a sharp "pic," similar to that of many other woodpeckers.

*Piculus chrysochloros*

GOLDEN-GREEN WOODPECKER

This uncommon denizen of the chaco woodlands was encountered in

eastern Formosa (14 kilometers northwest of Espinillo near the Pilcomayo River, and near the Paraguay River at 60 kilometers southeast of the city of Formosa) and in northern Santa Fe (1 kilometer east of Villa Ana), Argentina. The Golden-green Woodpecker is a close relative of the White-browed Woodpecker, and seems to replace it in the Chaco of Argentina and Paraguay. One male was observed for 20 minutes on September 20, near Espinillo, Formosa, feeding in a deliberate manner on the trunk and branches of a tree. It fed entirely by gleaning, and did not tap with its bill once (although it may do so). Most likely it was foraging for ants, which are common on trees in the Chaco. On September 24, I frightened a pair from an apparent nesting cavity in the center of a 30 cm. by 50 cm. ant (or termite) nest about 3 meters up in a tree. The male emerged from the cavity, and flew off with the female, which had been perched atop the round ant nest. I was unable to return to the area. One male obtained near Espinillo on September 18 weighed 55.7 grams. In contrast to the dark-eyed (chestnut) White-browed Woodpecker, this specimen of Golden-green Woodpecker had white irides.

*Piculus aurulentus*

WHITE-BROWED WOODPECKER

A male of this species drummed below a hole 7 meters up in a tree in an isolated patch of woodland ("monte") near the Uruguay River (6 kilometers southwest of Colonia Garabí, Corrientes) on September 27, 1967. Its mate, which was nearby when I approached the tree, flew off. The cavity was probably its nest, as the male proved to have enlarged testes (6 by 5 mm. and 7.5 by 5.5 mm., right and left, respectively) and a well-developed brood patch. A male was seen also near San Pedro, Misiones. The collected male weighed 68 grams and its stomach contained ants, ant larvae, and ant eggs. This species thus appears to forage arboreally for ants. Its irides are chestnut in color.

*Piculus rivolii*

CRIMSON-MANTLED WOODPECKER

Special attention was devoted to this species, the largest of its genus, because of my interest in flickers (*Colaptes*) and their relationships with *Piculus*. Unfortunately, we were able to locate but four individuals of this quiet species (inconspicuous despite its coloration). Crimson-mantled Woodpeckers were studied in the ecotone between "ceja" forest (cloud forest) and lower montane moist forest at 7 kilometers northwest of Carpish Pass in the Carpish Mountains of Huanuco, Peru, during

August 1 to August 4, 1968.

The activity of one pair of Crimson-mantled Woodpeckers was concentrated about a 1-acre area on a steep slope below a road, which was actively under construction, and within 50 meters of an occupied house. The center of this area was cut-over and eroded as a result of road construction above it. The surrounding forest was second-growth, and one isolated, small patch of woodland containing but five moderate-sized trees about 30-50 meters in height was visited regularly by the two birds. Nevertheless, they wandered widely downslope from this central area in which their nesting cavity was situated. Another individual was located about 300 meters downslope in dense forest.

As far as I could determine the birds observed were strictly arboreal. Foraging took place principally on the main and secondary branches in the crowns of various trees, although this may have been influenced to some extent by my presence. The woodpeckers foraged by gleaning and probing, rarely tapping audibly. Foraging sites that were especially favored were mossy places, the bases of epiphytes, and leaf bases. Here the birds probed, occasionally shaking the head and using the bill to push or throw aside pieces of moss or debris. One bird fed for two hours and pecked or tapped three times (one to three blows each time). Another did not tap in a half hour of active foraging. Their feeding is thus accomplished largely or entirely on the surface of the tree. The stomachs of the three adults that we collected were full of ants and ant eggs. The stomach of one also contained the remains of a single coleopterous larva and a millipede. The stomach of a second contained one small spider in addition to ant remains. The stomach contents of a third included two pieces of plant material, probably the covering of some fruit, as well as many ants.

The little behavior that I saw led me to believe that the birds were not nesting. A lone male that I collected as it drummed briefly on a stub after I had disturbed its foraging, proved to have bred already. This male had moderate-sized testes (right, 4 by 2 mm.; left, 6 by 2 mm., plus a 2 mm. curved tip as found in the testes of many woodpeckers, especially colaptes species), and a re-feathering brood patch. However, a pair, in which the male was active around a cavity 6 meters up a tree near the large open area mentioned above, proved to be nesting. Both birds had brood patches and enlarged gonads (male with right testis 8 by 4 mm., and left, 11 by 7 mm. plus a 4 mm. curved tip; female, an ovary measuring 14 mm. across and ova to 3 mm.), and the oviduct of the female was enlarged and had been used. I believe that incubation was underway at that time. The birds were not vocally active

and gave one call. The male drummed lightly near the presumed nest cavity several times. The only vocalization of this species that I heard was a single, flicker-like "kick-kick-kick-kick-kick-kick-kick" emitted by the female just after she had drummed beside the cavity. The male was in a nearby tree at the time, and both then flew off together. No displays were observed.

The three specimens weighed from 85.3 grams to 97.0 grams. Eye color varies from reddish brown to brown, the legs of this species are pale gray, and the bill is black.

This arboreal, flicker-like woodpecker differs from species of *Colaptes* (including "*Chrysotilus*") in its strictly arboreal habits, in its black tail and unmarked back, and in its quiet demeanor. Its bright colors were found to be less conspicuous than examination of museum skins had led me to believe, for in the shadows among the mossy branches its deliberate movements did not attract attention, and its crimson color easily allowed it to pass for an epiphyte if I was otherwise unaware of its presence. I noted in skinning the specimens that the skin was easily removed from the head—in fact, this species proved to be the easiest woodpecker to prepare of the many species I have collected. In this feature, as well as its vocalization, yellow shaft color (wings), general pattern of coloration, and bill, foot, and tail structure, it bears close resemblance to the flickers. Although within the genus *Piculus*, it is not distantly removed from the *atricollis-melanochloros* group of *Colaptes*.

*Colaptes (Chrysotilus) atricollis*

BLACK-NECKED FLICKER

This endemic, xeric-adapted flicker was studied in the vicinity of the Rimac Valley just east of Lima, Peru, in late August, 1968. Its habits will be discussed in another paper, and it is not included in table 1 (in the Department of Lima it is sympatric with no other woodpecker).

*Colaptes (Chrysotilus) punctigula*

SPOT-BREASTED FLICKER

This small woodland flicker was studied in Huanuco, Peru, and is to be discussed elsewhere. It is included in table 1.

*Colaptes (Chrysotilus) melanochloros*

GREEN-BARRED FLICKER

Studies of this flicker, including hybridization between the *melanochloros* and *melanolaimus* groups of races, will be discussed elsewhere (Short,

MS.; In press c, regarding the foraging association of *C. melanochloros* and *C. campestris*). Its occurrence is indicated in table 1.

*Colaptes campestris*

CAMPO FLICKER

Studies of this flicker (including "campstroides") will be published elsewhere (Short, MS.). Its distribution is indicated in table 1.

*Colaptes pitius*

CHILEAN FLICKER

As with other flickers, studies of this species will appear elsewhere, but its occurrence at various localities is indicated in table 1 (its riparian habitat in the lower Andean foothills is shown in Short, 1968, fig. 4).

*Colaptes rupicola*

ANDEAN FLICKER

This flicker was studied intensively in the Peruvian highlands (Short, MS.), and is not indicated in table 1 (it is sympatric with no other woodpecker).

*Celeus flavescens*

PALE-CRESTED WOODPECKER

The chaco form of this variable species (*C. f. kerri*; see Short, In press b, for a discussion of the taxonomy of *C. flavescens*) was observed in Formosa, and along the Parana River of northern Corrientes (two individuals). The Pale-crested Woodpecker, like species of *Piculus*, is an arboreal ant-feeder, securing its food by probing, gleaning, and rather more frequently than *Piculus chrysochloros*, by tapping and excavating. The latter two activities appeared confined to dead or dying branches so riddled with insect cavities that no prolonged drilling or excavating was necessary. The birds simply tapped a hole through the surface and fed, probably by extending the tongue into the ant tunnels. I watched a male feeding for 20 minutes on one small, dead branch, tapping occasionally, then feeding for a time before moving on a few inches. Upon breaking the branch (1½ cm. thick), I found an intricate arrangement of tunnels occupied exclusively by moderate-sized red ants, with many eggs in some of the chambers. The stomach of the woodpecker was full of the same ants, pupae, and eggs and contained no other food. Contents of the stomachs of the two Corrientes specimens were examined by W. L. Brown, Jr. One contained as many as three species of *Doli-*

*choderus*, and workers and brood of a species of *Crematogaster* (*brevispinosa* group), all ants that nest in trees. The stomach of the other bird, also filled entirely with ants, contained highly fragmented remains of a species of *Camponotus* (mainly soldiers), and workers of probably two species of *Crematogaster*.

These are quiet woodpeckers, and little loud tapping and few of their vocalizations were heard. In my presence the crests of foraging birds frequently were raised or partly raised, then brought down again. A call, "wee-wee-week," heard several times in the course of the field work, proved to be of this species. Once it was uttered by a lone female in a dead palm tree near Espinillo, Formosa.

In October and November nesting was underway, as I judged from the gonads and activities of the woodpeckers. A male was excavating in a dead limb of a live tree on November 5 in northern Corrientes. A pair was flushed from an apparent nesting cavity within an ant nest in a tree (4 meters up) on September 24 at 60 kilometers southwest of the city of Formosa. This nest was but 30 meters from a similarly situated nest of a pair of *Piculus chrysochloros*. Several individuals were heard to drum very lightly. All four birds that were collected proved to be males. The testes of all were moderately enlarged. Like flickers and certain other woodpeckers, the testes of the Pale-crested Woodpeckers were asymmetrical, the right testis being normal and the left testis "J"- or "L"-shaped. All of the specimens, collected between September 20 and November 5, had a partially or completely formed brood patch.

The specimens varied in weight from 110 to 140 grams (the Formosa birds weighed 110 and 128 grams, and the more eastern Corrientes birds weighed 130 and 140 grams). The color of the irides varied from reddish brown to chestnut. Their legs were gray, and their bills varied from gray-black to horn-colored above fading to dull ivory below. The salivary glands, like those of other ant-feeding woodpeckers, are very large and exude, when broken, an extremely sticky, mucus-like secretion. As an example of the variability of this form, one of the two Corrientes males had an almost completely "blonde" crest, face, and throat, whereas the other had a brown face, brown ear coverts, a half-brown throat, and a dusky cream crest.

*Drycopus lineatus*

LINNEATED WOODPECKER

Unfortunately this species was uncommon or absent from most of the areas that I visited in Argentina and Peru. A few were seen in Misiones, a few in northeastern Corrientes, and a pair was observed

northeast of Tingo Maria in Huanuco, Peru. A male that was observed and collected by R. S. Crossin was foraging in a large, partly dead tree, tapping with the bill, prying pieces of bark and pulling or pecking them off. I observed a female peck under a large flake of bark, then tap under it using the bill as a wedge in delivering blows that eventually cracked the piece of bark, which was then shoved off to one side by a sideward thrust of the bill. This bark-flaking was noted also by Wetmore (1926, p. 215) for *D. lineatus*; it appears to be the main type of foraging in the North American Ivory-billed Woodpecker (*Campephilus principalis*, Tanner, 1942). Pecking and tapping also seem to comprise a large portion of the foraging of this species. The foraging birds of a pair in Peru, and one Misiones individual foraged entirely in this manner, gradually working their way up large tree trunks from about the center to the top, tapping, pecking, and occasionally probing as they progressed. Excavating was not noticed as such, unless the numerous pecks and occasional tapping bouts used to break off bark in the above instances can be considered as excavating.

Three vocalizations, probably of two types, were heard. In Peru I heard one bird of a pair emit a loud "keer" when I appeared where it was foraging. A wounded bird in the hand gave a loud "pee" call, very like the alarm call ("peah") of the North American Flicker (*Colaptes auratus*, Short, pers. observ.). The calls of these two Linneated Woodpeckers probably represent variations on the same call which functions as an alarm. The other call was a loud "kee-ka-ka-ka-kowk" uttered by a foraging male high in a forest tree in Misiones. The birds occur in pairs or singly, and when in pairs they may forage on the same tree. On October 1, I saw one apparently nesting pair that were in a cavity in one tree of a line that surrounded a corral, and close to scattered fruit trees growing near the headquarters of an *estancia* 6 kilometers southwest of Colonia Garabi, Corrientes. We were not able to study this pair. Three adult males were obtained in northeastern Corrientes and Misiones between September 24 and October 7. Each male had a brood patch and enlarged testes (measuring from as little as 5 by 4 mm. to as much as 12 by 6 mm., with strong asymmetry; the male with a 12 by 6 mm. left testis had a right testis measuring only 7 by 5 mm., the larger testis being curved somewhat like that of *Colaptes*).

Collected birds weighed from 217 grams to 238 grams. All had white or ivory irides. The specimens, as well as other individuals that we observed, represented both the white-striped (typical *lineatus*) and black-backed ("erythrops") forms. These have been considered separate species but are clearly color morphs and hence conspecific (Short, In press b).

Because of the resemblance between species of *Dryocopus* and of *Campephilus*, I had hoped to find this species more common. No Linneated Woodpeckers were encountered in riparian forests along the Parana River of northern Corrientes and along the Paraguay River of Formosa. Likewise, we found none in the chaco woodland of western Corrientes (Wetmore, 1926, obtained one in eastern Chaco Province), northern Santa Fe, and eastern and central Formosa. This woodpecker apparently occurs rarely in the Argentine Chaco, where it is known only from the province of that name (Olrog, 1963). Otherwise, it is found in Argentina mainly within and near the subtropical moist forest of Misiones and immediately adjacent Corrientes, and in the subtropical dry forest of Salta (de Schauensee, 1966). Two related species of *Dryocopus* that occur in Argentina were not observed. *Dryocopus galeatus* occurs in Misiones, but from our observations and the paucity of specimens secured there by W. H. Partridge, it is uncommon (indeed, museums have but a few specimens of this species). We also failed to encounter the Black-bodied Woodpecker (*D. schulzi*), which appears to be uncommon and peculiarly distributed in the Chaco (see its range in Meyer de Schauensee, 1966). The Linneated Woodpecker occurs sympatrically with at least the similarly sized Crimson-crested Woodpecker (*Campephilus melanoleucus*) in northeastern Corrientes, and with the common and slightly larger Robust Woodpecker (*C. robustus*) in Misiones, but we noted no interactions among the species. Wetmore (1926) reported obtaining both a Linneated Woodpecker and Cream-backed Woodpeckers in eastern Chaco Province.

*Campephilus (Phloeocastes) melanoleucus*

CRIMSON-CRESTED WOODPECKER

This woodpecker was seen only in eastern Corrientes in the "gallery" forest along both the Uruguay and Parana rivers. No other campephiline woodpeckers were found at the same locality with the Crimson-crested Woodpecker, but Cream-backed Woodpeckers were encountered within a few kilometers west of the westernmost point where the former occurred. I saw few foraging birds, for they proved wary, usually moving upward on a tree trunk, and pecking ineffectually (displacement movement?) as if disturbed by my presence. One adult was excavating on the limb of a large forest tree before it was secured. I judged these woodpeckers to be rather silent and inconspicuous. Their movements are unlike those of the more typical "ivory-bills" such as *C. robustus*, for they maintain their body close to the tree with their feet less laterally and more nearly below the body.

Nesting apparently occurs in September. Three adults obtained in

early November had gonads reduced in size, brood patches re-feathering, and they were all molting (primaries through number 4, rectrices 2 or 2 and 3, some secondaries, and many body feathers were new). I presume those birds were engaged in an agonistic encounter, as all three were obtained "together" by two Argentines. A male taken on October 23 had small testes (3 by 2 mm.) and no brood patch—it may not have nested. A female taken on September 28 had a full brood patch; its ovary was enlarged (10 mm., ova to 3 mm.), as was its oviduct. This bird may have been incubating eggs. A female taken on October 14 had been accompanied by a male, which emitted a three-noted call "wink-at-chew," repeated four times. This female seems immature: its feathers are very soft, red feathering is incomplete over its eyes which were white, and its bill is much shorter and darker than those of adult females in the collection of the American Museum of Natural History.

In addition to noting the vocalization mentioned above, a male that was perched with a female atop a tall, dead stub overlooking a marsh northeast of Tingo Maria gave a series of double drum-taps, similar to those noted for other members of this genus. The female did not drum, but flew off in a few seconds. The male continued drum-tapping at a rate of two to three times per minute for five minutes, then flew off. We heard several other drum-taps in the vicinity, probably by this same bird.

Eye color in this species varies from ivory to pale yellow in the adults; the female thought to be immature had white irides. Bill color in the adults was pale below (horn-color to ivory), and gray-ivory to ivory-gray above. The bill of the immature female was fully gray above with whitish tomia, and white-based with a gray tip below. The legs of all six individuals were pale gray. The stomach of one contained diverse fragments of hard-shelled insects, grubs, and some ants.

*Campephilus (Phloeocastes) leucopogon*

CREAM-BACKED WOODPECKER

This chaco woodland bird was commonly observed in northern and southeastern Formosa, and twice in northwestern Corrientes. In the latter region it was noted within a few kilometers of where *C. melanoleucus* was observed and collected, but we did not find them together. This woodpecker forages chiefly by excavating, and to a lesser extent by tapping and pecking. Its excavating is accomplished by long, powerful blows, audible for some distance. Foraging sites varied from larger trees (in the Chaco these trees would be but 20 or 25 meters high) in the woodlands, to isolated tall or shorter trees in pastures, to fallen logs. The

stomach of one adult male contained larval beetles of a species unknown to me. Upward movement on a trunk is accomplished in hops with the feet placed moderately out to the sides, and the body held somewhat out from the trunk (about intermediate between the posture of *C. melanoleucus* and *C. robustus*).

This woodpecker, like other species of its genus, has a resounding double drum-tap heard during late September in Formosa (see Wetmore, 1926, p. 215). Because of its tameness, I was able to approach several drumming individuals quite closely. In contrast to its active foraging movements, a drum-tapping bird usually perches quietly, its head held far out from the trunk, delivers the double tap, and recovers from it in a stilted manner, slowly moving its head outward to the fullest extent, there to "freeze" in an alert attitude (as if watching for a potential intruder). All drum-taps were delivered while the bird perched vertically against a tree trunk rather than on a horizontal (limb) surface. The only vocalization of the Cream-backed Woodpecker that was heard was a loud, raucous "pee-yaw" or "kwee-yaw," in many cases given twice, and often following a drum-tap. Calls very similar or identical to this have been noted in the Powerful Woodpecker, the Magellanic Woodpecker (*C. magellanicus*), and the Red-necked Woodpecker (*C. rubricollis*; see Short, In press a). Although such a call may occur in the vocal repertoire of the congeneric Robust Woodpecker and the Crimson-crested Woodpecker, we failed to note it in the latter two species.

We did not see two Cream-backed Woodpeckers together, nor were they seen at nesting holes, although the "tear-drop" holes characteristic of this species were commonly noted in palm trees. A female from near Espinillo (September 19) had an enlarged ovary with ova measuring 2 mm., a much enlarged oviduct, and a full brood patch. A male obtained 60 kilometers south of Formosa on September 25 had moderately enlarged testes (6 by 3 mm.) and a brood patch. These birds probably were incubating or had small young in their nests.

Weights were obtained for two females (219 grams, 203 grams). The irides in this woodpecker are colored pale yellow. Cream-backed Woodpeckers have gray legs and, alone among species of its genus that I encountered in South America, an ivory-colored (somewhat buffy tinged) bill.

*Campephilus (Phloeocastes) pollens*

POWERFUL WOODPECKER

A pair of Powerful Woodpeckers were seen perched in a tree on a steep slope in forest (edge of lower montane moist forest and "ceja" or cloud

forest, 2450 meters elevation) 7 kilometers northwest of Carpish Pass in the Carpish Mountains, Huanuco, Peru, on July 30, 1967. The birds were briefly glimpsed but calls were heard once (and were recorded) before they flew downslope, and heard again several times from a greater distance. The calls were surprisingly like those of the Magellanic Woodpecker (*C. magellanicus*) discussed by Short (In press a), and are rendered "pee-yáw, pee-yáw." At this locality I heard the "double rap" of a camppephiline woodpecker twice, probably of this species (no other large woodpecker was noted in this region), but I could not be certain of this.

*Camppephilus (Phloeoceastes) robustus*

ROBUST WOODPECKER

This species was observed only in Misiones during October. It appeared to be relatively common in the upland subtropical moist forest above 400 meters elevation in the Misiones highlands. This forest, under strong pressure from cutting (mainly to prepare the land for cultivation), contains Brazilian pines (*Araucaria brasiliensis*) as a dominant element. Robust Woodpeckers foraged in the larger trees, including Brazilian pines. They visited lone pines (some dead or dying) frequently left out in the open after the forest was cut-over. Foraging is by excavating, tapping, pecking, and probing in that order. The loud whacking of their bills while foraging was frequently heard. They excavated (usually high up, and hence not easily observed) at the bases of branches, and particularly at the base of the top cluster of branches of Brazilian pines. Bark-stripping was not observed; rather the birds seemed to bore into the bark. The stomach of one bird contained hard-shelled remains of well-ground insects. The posture of Robust Woodpeckers while climbing is like that of the large Ivory-billed Woodpecker (*C. principalis*; see Tanner, 1942), and the Magellanic Woodpecker (*C. magellanicus*)—the head held far out from the trunk and the feet placed laterally as the birds appear to pull themselves upwards.

A characteristic sound in the forest is the loud double-tap, or drum-tap (Short, In press a) typical insofar as is known of all species of this genus. Some drum-taps that we heard may have been given by *Camppephilus melanoleucus*, but the latter was not observed in Misiones (although Misiones is within its range). The drum-tap produces a hollow loud "thump-ump," and may be rendered on any tree in which the bird is perched, that is, there is no preferred site from which the drum-tap is given. Drum-tapping birds perch quietly, and give one to three double-taps per minute (not in rapid succession) for as long as 30 min-

utes. The only call uttered by the Robust Woodpeckers that we observed was a single-noted "kee" or "kew." This call was given as a bird flew overhead, or when we came upon a foraging bird. They appear to be highly territorial as indicated by the frequency of the drum-taps and one interaction between two males. I came upon the latter birds southwest of San Pedro as they chased each other up the trunk of a large tree. With wings outstretched, one pursued the other around the trunk, until they had reached the top. No vocalizations were heard during the chase.

Two collected males weighed 255 and 256 grams; their testes were moderate in size (5 by 3 mm., 4.5 by 2 mm., respectively) and their brood patches were re-feathering. Two females weighed 230 and 242 grams. The former was prepared in alcohol, and the latter had a large ovary (12 by 9 mm., ova to 1.5 mm.), and a brood patch. These data indicate that young birds were well-developed nestlings or had just left the nests by early October. Eye color varies from ivory-white to yellow in adults of this species. Robust Woodpeckers have gray legs, their bills are dusky horn-color above and at the base, fading to ivory below and at the tip.

*Campetherus (Ipocrantor) magellanicus*

MAGELLANIC WOODPECKER

The occurrence of this woodpecker at various localities in the southern Andes is indicated in table 1. Its habits are discussed elsewhere (Short, In press a).

DISCUSSION

Several aspects of the ecology and distribution of the woodpeckers that I observed might be discussed. The sympatric occurrence of these species at various localities is indicated in table 1 (for the numbered localities see the list of localities in the Introduction). These species are categorized by size; and their habitats, foraging modes, and food are summarized in table 2. In consideration of the foraging modes noted in the latter table, the limited number of observations on which the statements are based should be kept in mind. As an example, an arboreal ant-foraging species may appear to feed mainly by gleaning and probing, but one cannot ignore the perhaps critical importance of the bill used only occasionally for tapping or excavating. Ant nests may be broken open with one brief flurry of tapping or excavating—the bird could glean or probe for a considerable period with no further need for excavating. Limited, or even extensive observations thus would tend to

TABLE 1  
OCCURRENCE OF WOODPECKERS AT CERTAIN ARGENTINE AND PERUVIAN LOCALITIES<sup>a</sup>

Species	Locality																	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
<i>Picumnus cirratus</i>																		
<i>Picoides mixtus</i>																		
<i>Picoides ligarius</i>																		
<i>Melanerpes candidus</i>																		
<i>Melanerpes cruentatus</i>																		
<i>Melanerpes flavifrons</i>																		
<i>Melanerpes caeruleus</i>																		
<i>Veniliornis passerinus</i>																		
<i>Veniliornis spilogaster</i>																		
<i>Piculus chrysochloros</i>																		
<i>Piculus aurulentus</i>																		
<i>Piculus rufoti</i>																		
<i>Colaptes punctigula</i>																		
<i>Colaptes melanochloros</i>																		
<i>Colaptes campestris</i>																		
<i>Colaptes pitius</i>																		
<i>Ceteni flavescens</i>																		
<i>Dryocopus lineatus</i>																		
<i>Campetherphilus melanoleucus</i>																		
<i>Campetherphilus leucopogon</i>																		
<i>Campetherphilus pallens</i>																		
<i>Campetherphilus robustus</i>																		
<i>Campetherphilus magellanicus</i>																		

<sup>a</sup> See text for these localities; 1-16 are in Argentina, 17-18 are in Peru. Parentheses indicate that the species was seen or collected near that locality.

underestimate the significance of a less commonly used mode of foraging.

Fully one-third or even one-half of the species at each locality are primarily ant-foragers. All of these ant-feeding species are small- to medium-sized. Of these species, the entirely arboreal ones do not occur south of the fringes of the subtropics (northern Santa Fe, northern Corrientes). One species, the Green-barred Flicker, is principally an arboreal ant-forager in tropical and (mainly) subtropical forests, but individuals of its southern populations (reaching Patagonia) forage both terrestrially and arboreally (Short, In press c). All the ant-foraging woodpeckers of temperate Argentina are partly or fully terrestrial. The presence of large numbers of species of diverse groups of ant-eating woodpeckers largely accounts for the greater number of kinds of woodpeckers in tropical and subtropical regions, compared with temperate regions.

Sympatry among similarly sized woodpeckers is limited to those with quite different habits. *Picoides mixtus* and *Melanerpes cactorum*, similar in size and sympatric, are gleaners and probers, but the former does some tapping, and, more importantly, is an active forager on small branches and branchlets, whereas *M. cactorum* is a deliberate forager on the upper main trunks of trees. *Colaptes punctigula*, sympatric with *Melanerpes cruentatus* of similar size, feeds on ants arboreally and on the ground, whereas the latter woodpecker is a forager for other insects (also ants) and fruits mainly at the tops of trees. As many as four medium-sized species of the various woodpeckers that I have considered may occur together. These are the terrestrially foraging *Colaptes campestris* (which is independent of trees, although using them for nesting purposes when available), the partly terrestrially foraging *C. melanochloros* (requiring trees for nesting and some of its foraging), the arboreal *Celeus flavescens*, and the arboreal *Melanerpes candidus*. The first three of these are ant-eating woodpeckers. *Colaptes melanochloros* probably competes with *C. campestris* when it feeds terrestrially, but only when in proximity to trees; these two species associate at the same ant hills (Short, In press c). Arboreally foraging individuals of *C. melanochloros* compete with *Celeus flavescens* (their stomach contents include some of the same species of ants), although the latter seems less a gleaner and more an excavator for ants. The abundance of ants in most areas that I visited suggests the possibility that factors other than availability of food may impose limits on the distribution and abundance of species feeding on the same food (availability of, and competition for, suitable nest sites is an obvious factor to be considered).

The greatest number occurring together was nine species, south of

TABLE 2  
SIZE, HABITATS, FORAGING MODE, AND FOODS OF WOODPECKERS STUDIED<sup>a</sup>

Species	Weight in Grams <sup>b</sup>	Habitat	Foraging Mode; Food
TINY WOODPECKERS			
LITTLE WOODPECKERS			
<i>Picumnus cinnamomeus</i>	11	Understory, edges of forest, woodlands	Tapping, probing, gleaning; insects
<i>Picoides mixtus</i>	26	Riparian brush, chaco woodland	Gleaning, probing, tapping; insects
<i>Picoides ligatus</i>	35	Fuegian <i>Nothofagus</i> forest	Gleaning, probing, tapping; insects
<i>Melanerpes cactorum</i>	35	Chaco woodland, pantanal palms	Gleaning, probing; insects, plants?
<i>Veniliornis passerinus</i>	35	Riparian woodland, bamboo	Probing, tapping, excavating; insects
<i>Veniliornis spilogaster</i>	40	Subtropical moist forest, riparian	Probing, tapping, excavating?; insects
SMALL WOODPECKERS			
<i>Melanerpes cruentatus</i>	62	Subtropical moist forest edge	Diverse modes; insects (ants), fruits
<i>Melanerpes flavifrons</i>	?	Subtropical moist forest edge	Probably diverse modes; probably diverse
<i>Picus chrysocrotaphus</i>	55	Chaco woodland	Gleaning, probing, tapping; ants
<i>Picus aurulentus</i>	68	Subtropical moist forest	Gleaning-probing?; ants
<i>Picus rufiventris</i>	90	Montane ceja (cloud) forest, edges	Gleaning, probing; ants (mainly)
<i>Colaptes punctigula</i>	75	Subtropical moist forest edge	Arboreal-terrestrial; ants
<i>Colaptes atricollis</i>	90	Shrub desert (secondarily cultivated areas)	Arboreal (terrestrial?); ants

TABLE 2—(Continued)

Species	Weight in Grams <sup>b</sup>	Habitat	Foraging Mode; Food
<b>MEDIUM WOODPECKERS</b>			
<i>Melanerpes candidus</i>	130	Subtropical forest and woodland edges	Diverse modes; insects, plant material
<i>Colaptes melanochloros</i>	125	Forest to chaco woodland, edges	Arboreal-terrestrial; ants
<i>Colaptes campestris</i>	160	Grassland, open cultivated land	Terrestrial; ants
<i>Colaptes pitius</i>	150	Fuegian forest edge, riparian woods	Mainly terrestrial; ants
<i>Colaptes rufipectus</i>	170	Andean grassland (puna)	Terrestrial; insect larvae
<i>Celeus flavescens</i>	130	Chaco woodland, riparian woods	Tapping, excavating; ants
<b>LARGE WOODPECKERS</b>			
<i>Dryocopus lineatus</i>	220	Subtropical moist forest, edges also	Pecking, tapping, bark-flaking; insects
<i>Campetheria melanoleuca</i>	220	Subtropical moist forest, riparian	Excavating-tapping; insects
<i>Campetheria leucopogon</i>	215	Chaco woodland, edges also	Excavating-tapping; insects (beetles)
<i>Campetheria pollens</i>	?	Montane ceja (cloud) forest	Excavating-tapping; insects?
<i>Campetheria robustus</i>	240	Subtropical moist forest	Excavating-tapping; insects
<b>VERY LARGE WOODPECKERS</b>			
<i>Campetheria magellanicus</i>	320	Fuegian <i>Nothofagus</i> forest	Diverse modes; insects

<sup>a</sup> These are summarized; see text for details.

<sup>b</sup> Approximate average weight, both sexes included.

the city of Formosa, followed by eight species near Espinillo, Formosa (table 1). The list is apt to be nearly complete for these localities, with no more than one or two species having been missed. For other localities, particularly in Misiones and in Peru, the list is partial and may include only one-half to two-thirds of the species actually occurring there. The locality south of the city of Formosa included somewhat more varied woodlands and bamboo forest (not found near Espinillo, and containing *Veniliornis passerinus* which we did not encounter near Espinillo) compared with the largely grazed woodland and savanna near Espinillo, but otherwise these areas were similar. I was surprised to find so many species in woodland that seemed uniform and of rather low height, in addition to being grazed by cattle. Nevertheless, woodpeckers were conspicuous and common. I attribute this partly to the considerable amount of available dead wood (probably a result of extended wet and dry seasons), and the abundance of palms which nesting woodpeckers frequently use. All size categories (table 2) except Very Large are represented at both Formosan localities, with two or three species in each of the Little and Medium categories. Four of the species at each locality are ant-foragers. The number of woodpeckers progressively diminishes southward from Formosa and Corrientes. In temperate Argentina three species of woodpeckers occur, one Little species (*Picoides mixtus*) and two ant-foraging Medium species (*Colaptes campestris*, *C. melanochloros*). In the cold temperate south Andean and Patagonian region these are replaced by three other species, one Little (*Picoides lignarius*), one Medium ant-forager (*Colaptes pitius*), and one Very Large species (*Campephilus magellanicus*). Part of this diminution is due to a reduction in the number of ant-foragers (especially arboreal), and part to the loss of Tiny, Small, and Large species. Compared with cold temperate North America the paucity of south temperate species is attributable to the scarcity of species of *Picoides* and to failure of melanerpine species to adapt to temperate conditions in South America as they have in North America. Of course, the pampas grasslands and arid Andean slopes, penetrated by arboreal growth only in the form of low (chaco) scrubby woodland and occasional isolated patches of trees, act as strong barriers to woodpeckers. Thus, only the scrub-woodland species of *Picoides*, the terrestrially foraging *Colaptes*, and the ancestor of *Campephilus magellanicus* (which probably was a chaco woodland species somewhat like the modern *C. leucopogon*), were able to penetrate these barriers and reach the Fuegian forests of Patagonia.

Of the various genera *Picumnus*, *Veniliornis*, *Piculus*, and *Celeus* barely reach the fringes of the temperate portion of southern South America.

*Melanerpes (cactorum)* and *Dryocopus* each contain species which penetrate the temperate area, but not very far. Nevertheless, the distribution of *Dryocopus* is interesting in that three species, the tropical-subtropical *lineatus*, and the subtropical-temperate edge species *schulzi* and *galeatus*, reach the temperate areas of Argentina and southernmost Brazil. Elsewhere in the topics only *lineatus* occurs, and in North America the latter species is replaced by *pileatus*. Temperate southern South American woodpeckers include species of *Picoides*, which genus has been successful in temperate regions elsewhere (Nearctic, Palearctic), *Colaptes* (also successful in North America), and *Campephilus*. The last, with several species attaining the temperate fringe of Argentina and one species in the Fuegian forest, also occurs in temperate Mexico and North America.

Although the size categories in table 2 are artificial, I am impressed with the actual gaps among them. The many piculets (*Picumnus*, *Sasia*) are all about the same size, except for one species (of *Nesocites*, an insular West Indian form). North American and European woodpeckers can be categorized similarly by size, and their species fall within the weight limits included in this table. Widespread sympatry of related species seems to involve either a marked shift in size (for example, between the Little *Picoides pubescens* and Small *P. villosus* in North America, and *Melanerpes cactorum* and *M. candidus* in Argentina), or a marked difference in habits (as in *Colaptes campestris-melanochloros*). Very closely related species, similar in size, are allopatric, as in the following species pairs (each of which comprises a superspecies, or a portion of a superspecies; see Amadon, 1966): *Picoides mixtus-lignarius*, *Veniliornis passerinus-spilogaster?*, *Melanerpes cruentatus-flavifrons*, *Piculus chrysochloros-aurulentus*, and *Colaptes punctigula-melanochloros*. The fully terrestrial species of *Colaptes* (*pitius*, *rupicola*, *campestris*) are not so closely related as to comprise a superspecies, but they too are allopatric.

## SUMMARY

Some habits of 18 species of Argentine and Peruvian woodpeckers are reported. Particularly noteworthy is the communal nesting of *Melanerpes cruentatus*, at least 11 individuals of which fed young at three nest sites, with some adults feeding at all three sites. Factors, such as foraging mode and food utilized, are considered with respect to the sympatric occurrence of woodpeckers (including five additional species the habits of which are not reported here) in parts of those two countries. From one-quarter to one-half the species of woodpeckers at each locality visited are primarily ant-foragers. Arboreal ant-foraging species are virtually restricted to the tropics and subtropics, accounting in part for the re-

duction in number of woodpeckers in temperate South America. The species fall into six, rather well-delimited categories of size. Primarily ant-foraging species fall without exception into the two central (Small, Medium) categories of size. Three species occurring in Patagonian forests are separated by great size gaps. Similarly sized species either differ considerably in habits, or are allopatric in their distribution. The latter include a number of groups of closely related species (forming superspecies).

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